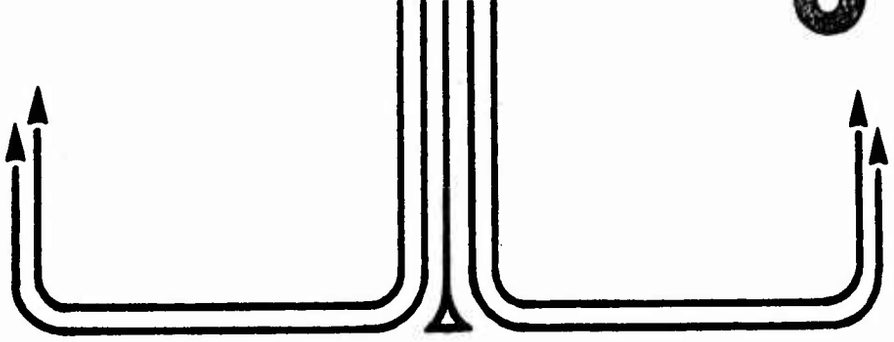
AIR COMMAND AND STAFF COLLEGE

STUDENT REPORT

MATRIX ORGANIZATIONS:
OVERCOMING THE DISADVANTAGES

MAJOR HAROLD E. BERG 84-0225

"insights into tomorrow"



DISCLAIMER

The views and opinions expressed in this document represent the personal views of the author only, and should not in any way be construed to reflect any endorsement or confirmation by the Department of Defense (DoD), the Department of the Air Force, or any other agency of the United States Government.

This document is the property of the United States Government and is not to be distributed outside official agencies of the United States Government without permission of the Commandant, Air Command and Staff College, Maxwell AFB, Alabama, 36112. Clearance for public release under the provisions of AFR 190-1 has not been obtained.

~~For US Government Agencies and Their Contractors~~

A loan copy of the document may be obtained from the Air University Interlibrary Loan Service (AUL/LDEX, Maxwell AFB, Alabama, 36112) or the Defense Technical Information Center. Request must include the author's name and complete title of the study.

This document may be reproduced for use in other research reports or educational pursuits contingent upon the following stipulations:

-- Reproduction rights do not extend to any copyrighted material that may be contained in the research report.

-- All reproduced copies must contain the following credit line: "Reprinted by permission of the Air Command and Staff College."

-- All reproduced copies must contain the name(s) of the report's author(s).

-- If format modification is necessary to better serve the user's needs, adjustments may be made to this report--this authorization does not extend to copyrighted information or material. The following statement must accompany the modified document: "Adapted from Air Command and Staff Research Report (number) entitled (title) by (author) ."

-- This notice must be included with any reproduced or adapted portions of this document.

All Other Requesters

All requests for this document must be submitted to the Air Command and Staff College/EDOC, Maxwell AFB, Alabama, 36112, for approval.

REPORT NUMBER 84-0225

TITLE MATRIX ORGANIZATIONS: OVERCOMING THE DISADVANTAGES

AUTHOR(S) MAJOR HAROLD E. BERG, USAF

FACULTY ADVISOR MAJOR ROBERT B. HEATH, JR., ACSC/EDCM

SPONSOR CAPTAIN JEFFREY S. AUSTIN, LMDC/ANB

Submitted to the faculty in partial fulfillment of
requirements for graduation.

AIR COMMAND AND STAFF COLLEGE
AIR UNIVERSITY
MAXWELL AFB, AL 36112

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 84-0225	2. GOVT ACCESSION NO. AD-A145 314	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Matrix Organizations: Overcoming The Disadvantages		5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Harold E. Berg, Major, USAF, [redacted]		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS ACSC/EDCC Maxwell AFB AL 36112		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS ACSC/EDCC Maxwell AFB AL 36112		12. REPORT DATE APRIL 1984 13. NUMBER OF PAGES 34
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. *(of this report)* UNCLASSIFIED 15a. DECLASSIFICATION DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

STATEMENT "A"
Approved for public release;
Distribution is unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Provides a background on the matrix organizational structure. Identifies typical disadvantages of the matrix organization, with the focus on project and functional managers, functional experts, and project teams. Various techniques to counteract these disadvantages are examined and evaluated for potential application in matrix organizations.

DD FORM 1 JAN 73 1473 / EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

PREFACE

Although I had been exposed to matrix management in the classroom, I did not develop a full appreciation for its potential hazzards until my assignment in Air Force Systems Command as a project officer and subsequently, as a program manager. I observed many people who were unaware of the inner workings of the matrix structural organization. People entered the matrix environment with little or no specific preparation. Partially due to this experience, I perceived the need for an updated consolidation of typical matrix disadvantages, accompanied by potential solutions.

ABOUT THE AUTHOR

Major Berg received a BA in Chemistry from Elmhurst College and a MS in Systems Management from the University of Southern California. He is also a graduate of the program management course at Defense Systems Management College. He has held management positions in the Deputy for Propulsion and the Deputy for Tactical Systems at Aeronautical Systems Division, Wright-Patterson AFB, Ohio. Previously, Major Berg flew C-141s. He is currently attending Air Command and Staff College.

TABLE OF CONTENTS

List of Illustrations ---------- vi
Executive Summary ---------- vii

CHAPTER I - INTRODUCTION
- Background ---------- 1
- Benefits ---------- 4
- Application ---------- 9

CHAPTER II - MATRIX DISADVANTAGES
- Power Struggles ---------- 10
- Two-Boss Dilemma ---------- 11
- Interpersonal Skills Dependency ---------- 12
- Professionals ---------- 13
- Cost of Communication ---------- 14
- Groupitis ---------- 14
- Uncontrolled Layering ---------- 14
- Navel Gazing ---------- 15
- Decision Strangulation ---------- 18

CHAPTER III - SOLUTIONS
- Education ---------- 16
- Interpersonal Skills Development ---------- 17
- Team Development ---------- 19
- Project/Functional Interface ---------- 20
- Recognition of Professionals ---------- 24
- Responsibility Clarification ---------- 24
- Effective Communication ---------- 25
- Structure ---------- 26

CHAPTER IV - SUMMARY/RECOMMENDATIONS
- Summary ---------- 29
- Recommendations ---------- 29

REFERENCES ---------- 32

LIST OF ILLUSTRATIONS

TABLES

TABLE 1 - Summary of Problems and Solutions ---------- 30

FIGURES

FIGURE 1 - Typical Functional Organization ---------- 2

FIGURE 2 - Typical Project Organization ---------- 3

FIGURE 3 - Typical Matrix Organization ---------- 6

FIGURE 4 - Range of Alternatives ---------- 27

EXECUTIVE SUMMARY

Part of our College mission is distribution of the students' problem solving products to DoD sponsors and other interested agencies to enhance insight into contemporary, defense related issues. While the College has accepted this product as meeting academic requirements for graduation, the views and opinions expressed or implied are solely those of the author and should not be construed as carrying official sanction.

"insights into tomorrow"

REPORT NUMBER 84-0225

AUTHOR(S) MAJOR HAROLD E. BERG, USAF

TITLE MATRIX ORGANIZATIONS: OVERCOMING THE DISADVANTAGES

I. Problem: The matrix organizational structure has become very common throughout industry. It is also used in the United States Air Force. The matrix design structure offers many advantages over the functional and project organizational structures. However, problems typical of the matrix design exist. Some of these are serious and are not being properly identified or addressed.

II. Objective: To identify potential solutions or preventive steps to typical matrix organizational problems. This will be accomplished by identifying significant problems which have been associated with the matrix design. Potential solutions will then be examined for possible application in solving or alleviating the identified problems. The final objective is to develop specific recommendations which might be useful especially to Air Force organizations using a matrix organizational design structure.

III. Data: Nine problems are identified as being inherent to the matrix design. In some cases the matrix design is merely very susceptible to a specific problem which may also be found in other organizational structures. These problems have been identified by several authors and observers. Problems involve managers, functional experts, and groups within the matrix. The most frequently identified problems are power struggles, the two-boss dilemma, and interpersonal skills dependency. Power struggles often occur between project and functional managers Functional workers in a project sometimes get caught in-the-middle. They must please two bosses, the project manager and their functional supervisor. The organizational ambiguity suggested by these first two problems leads to the third and perhaps most significant problem. Matrix management requires above-average interpersonal skills on the part of all employees. Many employees are lacking in this area for various reasons. Solutions or preventive measures are

available to meet the challenge of matrix problems. The most promising solutions are education, interpersonal skills development, and team development. The matrix environment is often a new experience and education is a necessity. The continuing development of the individuals' interpersonal skills and techniques for team development also address identified problem areas in matrix management.

IV. Conclusions: All problems typical for a matrix organization cannot eliminated. However, they can certainly be alleviated to improve organi: :ional effectiveness. The matrix organization is a complex structural design t at complicates human interfaces. One of the most prevalent problems is the lack of understanding matrix management. Knowing what to expect is half the battle. Once the general philosophy of matrix management is understood and the organization's specific operational aspects are known, the required skills and relationships can then be developed.

V. Recommendations: Matrix organizations should establish a formal educational program to indoctrinate all employees in the philosophy and operations of matrix management. This should complement individual orientation from an employee's immediate supervisor. Matrix organizations should also conduct continuing programs in interpersonal skills and team development for all levels of the organization.

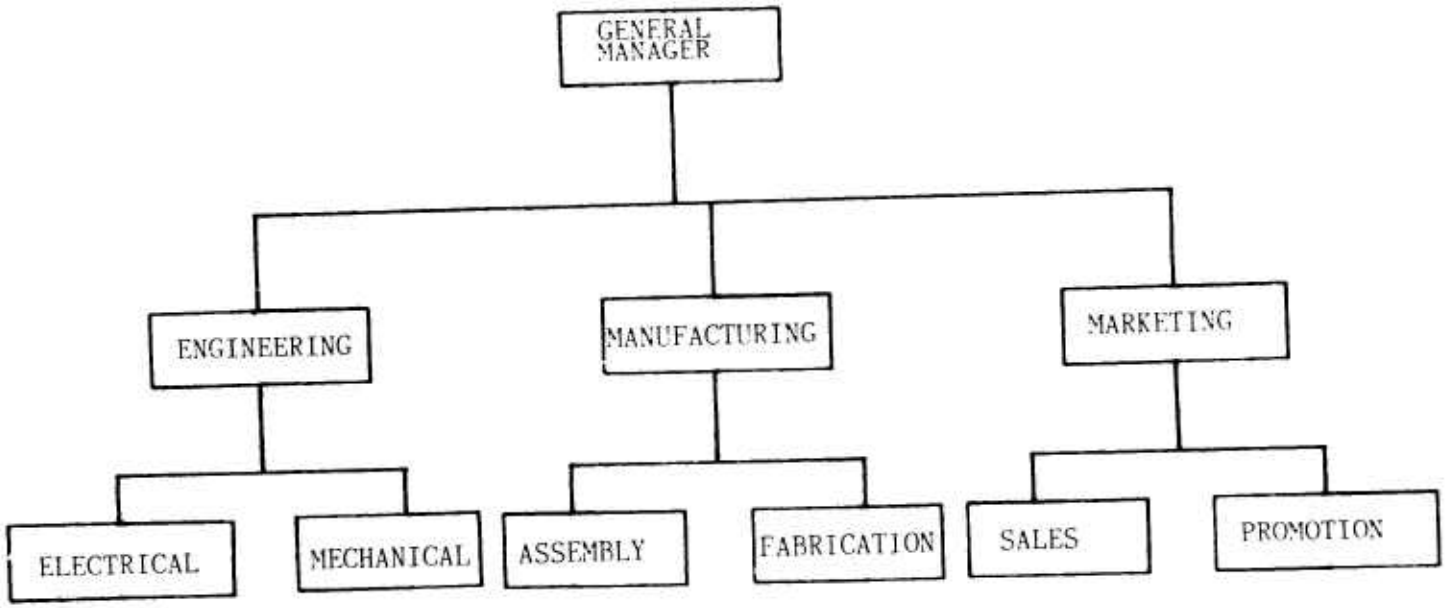
CHAPTER I

INTRODUCTION

The matrix organizational design is becoming more common in industry. Yet, many people working in the matrix structure still appear to have little knowledge about how this type of organization is supposed to function. In addition, new personnel are often unaware of the potential problems which are often associated with the matrix design. Following a description of the evolution of the matrix design, this paper will highlight some of the matrix structure's more prevalent weaknesses and then offer some potential remedies.

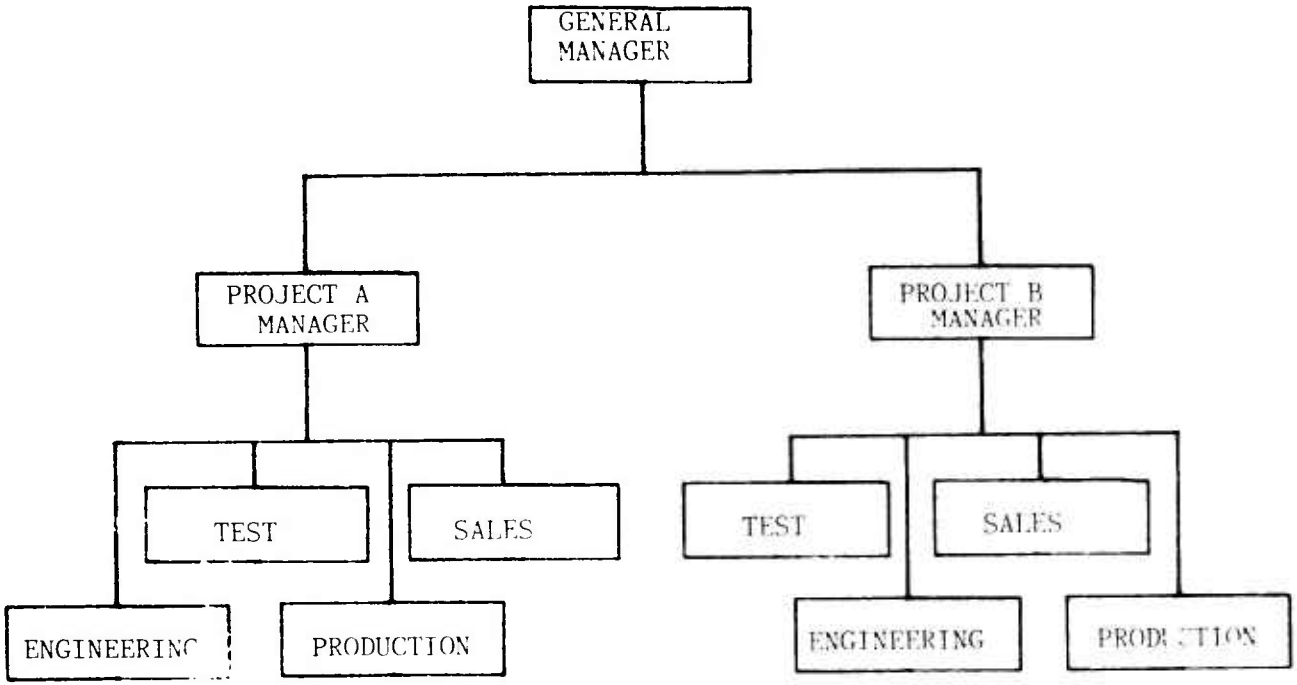
Background

The matrix organizational design originated and gained acceptance primarily in the aerospace industry. The traditional functional organizational structure (Fig 1) appeared inappropriate for the dynamic atmosphere of highly complex and rapidly changing projects (Kingdon, 1973). The functional structure concentrated on specialization within a function but was not ideally suited to multiple projects, technology, and dissimilar customers (Rowen, Howell, and Gulliotti, 1980). The technical complexities of projects required a systems approach with a single focal point to direct the effort. In this environment there existed a need to bring various skills or areas of technical expertise under a single coordinating office. Therefore, an organizational structure that placed complete control and responsibility of a project under a single individual emerged. This early replacement for the functional structure, the project organization (Fig 2), was structured so that the project (or program) manager



Typical Functional Organization (Galbraith, 1971)

Figure 1



Typical Project Organization (Modified from Albanese, 1978)

Figure 2

controlled all relevant resources for project activities and was responsible for the planning, organizing, and ultimately the results of their project (Flake and Archibald, 1968). Project management grew in popularity due to the early successes in the Polaris missile program and NASA's moon-shot project (Peters, 1979). However, experience surfaced some important drawbacks with the strict project organizational structure.

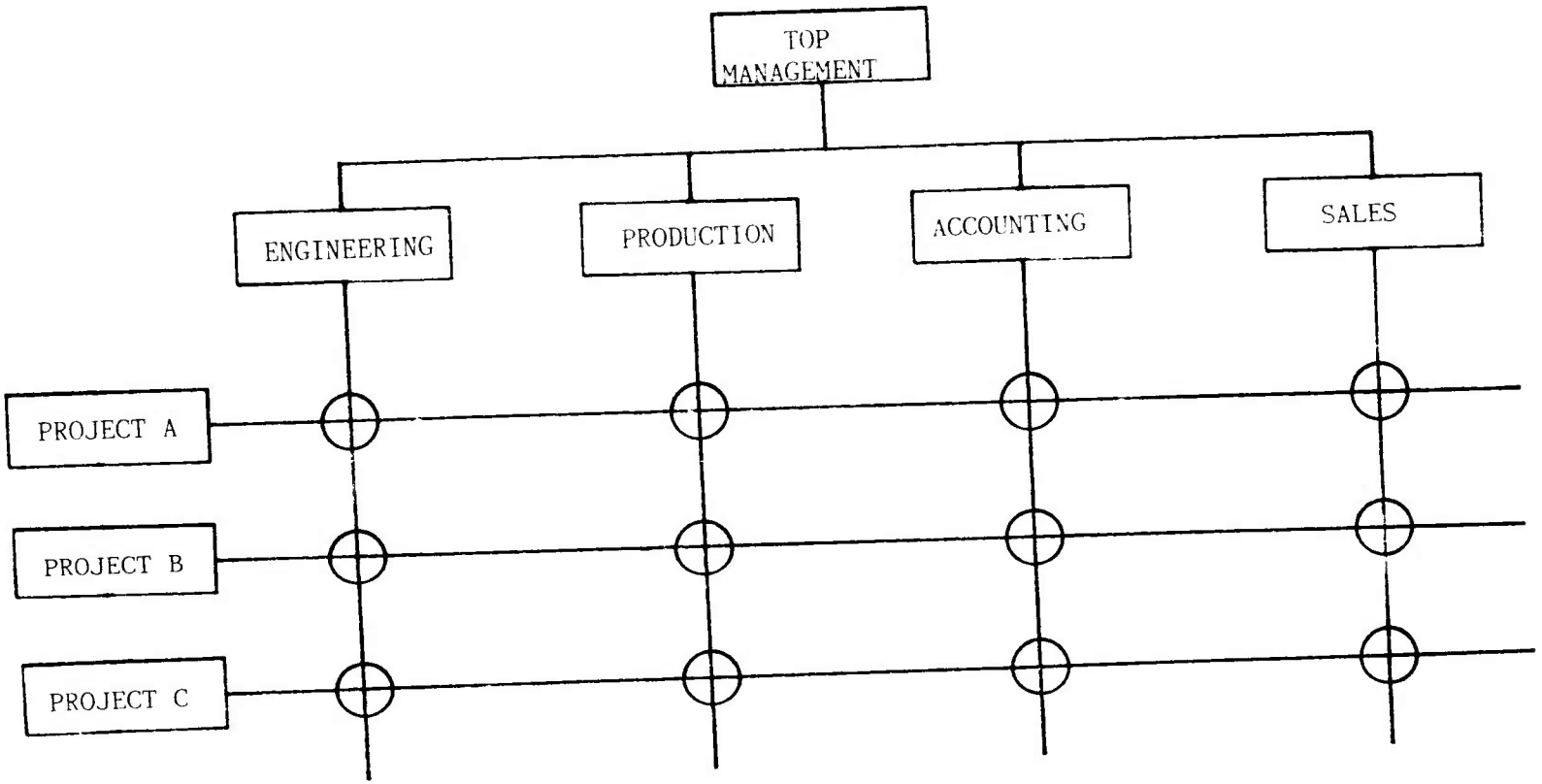
The project organization was relatively unresponsive to the dynamics inherent in an organization made up of multiple, changing projects. It did not provide the continuity required to handle future projects as well as current projects (Knight, 1977). Economies of scale were sacrificed. Each project had its own dedicated functional expertise, duplicating that of other projects (Rowen et al, 1980). This inefficient use of human resources was particularly significant to the United States Air Force, which could not afford to waste limited engineering talent. In addition, the absence of a functional home office not only threatened the continuing growth in technical expertise of individuals, but also limited the continued development of technologies. From the inadequacies of both the functional and project organizational structures evolved the matrix design.

Benefits

In order to thoroughly examine the matrix concept, one must appreciate the positive features in addition to the drawbacks of this organizational approach. The matrix design attempts to combine the advantages of both the functional and project designs. It is designed to handle situations

that require the continued use of highly specialized skills (advantage of the functional structure) while also requiring extensive coordination and integration of many diverse activities (advantage of the project structure) (Albanese, 1978). Figure 3 is an example of a typical matrix organization. In a matrix, each project is a distinct entity under the responsibility of a program manager. The program manager has limited position authority and does not have absolute control over personnel and resources. All projects are supported by segments of the functional disciplines, such as engineering or manufacturing. The program manager coordinates with the functional managers, who control the functional experts, to arrange the necessary work effort. When the project is completed or when the specific functional job is finished, these functional people are reassigned to either their functional unit (home office) or to another project. With relatively small projects, which do not require full-time experts, functional personnel may be assigned to more than one project at a time. This arrangement is often referred to as a "basket" operation. Regardless of the arrangement, the matrix design offers some important advantages over other organizational structures.

The basic strength of the matrix organization is the accommodation for the balance of specialization and coordination needs. The design allows for a quick response to unanticipated changes in job definitions and allocations (Sayles, 1976). Although many specific benefits have been attributed to the matrix design, only three primary attributes which appear to be common throughout matrix organization literature will be addressed. These are dual focus, efficient use of scarce resources, and the enhancement of an organization's information processing capability



Typical Matrix Organization (modified from Mee, 1964 and Rowen, et at,.1980)

Figure 3

(Davis and Lawrence, 1977; Cleland and King, 1975; Gunz and Pearson, 1977; Cleland, 1981b; Kolodny, 1979; Kolodny, 1981).

Dual Focus

Dual focus refers to the attention placed on a single goal by both the functional and the project worlds. Concentration on both complex technical issues and on project requirements is critical and neither perspective can take a back seat. The matrix structure allows for equal representation of both project-oriented managers and functional specialists so that decisions concerning cost, schedule, and product quality (performance) can be balanced (Davis and Lawrence, 1977). The need for dual focus comes from the recognition within a high technology organization that in addition to maintaining technical expertise and a competitive edge, the organization must be equally responsive to the product and the market sector (Kolodny, 1981). In a matrix, a project team can concentrate its efforts on achieving the project goal while using resources of functional departments (DeMaagd, 1983). Project managers are responsible for results and functional managers are responsible for providing the resources (expertise) to achieve the results. Even though the perspectives and concerns are different, both project and functional managers are focused on successful project execution (Cleland, 1981a).

Efficient Use of Scarce Resources

The second major benefit of the matrix design structure is its tendency to allow for the efficient use of scarce resources. The selective use of manpower can be flexible due to the pool of specialists that reside in the functional departments (Cleland and King, 1975). For

example, instead of hiring a metalurgist for every project, one or a few can selectively cover several projects. Often the projects needs do not justify full-time application of specific resources. The matrix design depends on shared usage to be responsive to sequential and fluctuating demands (Kolodny, 1981). This provides a dynamic and flexible approach toward human resource and program management. At least on the surface it appears to achieve economies of scale in human terms (Davis and Lawrence, 1977).

Enhanced Information Processing Capacity

The final significant attribute is the enhancement of the organization's information processing capacity. The demands of information flow are great in highly complex, fast-paced projects. The matrix organization enhances this flow through established lines of communication and centralized decision points (Cleland and King, 1975). Davis and Lawrence (1977) give three reasons for the overwhelming need for information processing in some of today's organizations. First, they identify changing and unpredictable demands. This breeds uncerta nty, which requires an enhanced information-processing capability. Secondly, increased complexity of the organization's tasks adds to the importance of information flow. And finally, the greater the interdependence among the organization's people, the greater the needs. These people actually depend on accurate and timely information to accomplish their interrelated tasks. The matrix design makes formal a complex communication network. This is not necessary simply to inform people after the fact, but rather to provide people information so that they may act with the whole project in mind. Another benefit of the matrix design is that more people tend

to think in generalist terms rather than suboptimizing segments of a project. This improves the organization's information-processing capacity (Davis and Lawrence, 1977).

Application

Many companies that deal in complex, highly technical projects use various forms of the matrix structural design. This is especially true in the defense industry where companies are in the forefront of technological advancement. A few examples are TRW, General Electric, and Texas Instruments (Kolodny, 1981; Cleland, 1981a). They depend on exploiting new technology and delivering useful products quickly. Due to the nature of the business, these organizations require a flexible, multidisciplined approach driven by the urgency of hard deadlines and fluctuating workloads. There exists in these companies the necessity to simultaneously emphasize tight schedules and scarce resources along with technical expertise. A form of matrix design seems to meet the needs of many of these companies. The Air Force Systems Command also uses the matrix design structure in varying degrees at its product divisions.

The matrix organization is not a cure all and will not in itself insure smooth sailing. It is not appropriate for all companies. Some companies tried it and pulled back, such as the Dutch-based Philips (Kolodny, 1981). However, even if applied correctly, there exist certain pitfalls with matrix management. The structure and principles of matrix organizations make them vulnerable to certain problems. The focus of the remainder of this paper will be on typical disadvantages and problems of the matrix organizational structure. This will be followed by an investigation into potential cures and solutions to these selected problems.

CHAPTER II

MATRIX DISADVANTAGES

There have been many weaknesses identified as inherent to the matrix organizational structure. The structure itself sometimes simply creates the climate for potential problems. The severity of the specific problems is dependent on the matrix application and the people involved. The problems that will be addressed in this chapter are power struggles, two-boss dilemma, interpersonal skills dependency, professionals, cost of communication, groupitis, uncontrolled layering, navel gazing, and decision strangulation.

Power Struggles

Power struggles between project and functional managers are practically inevitable. The matrix actually institutionalizes organizational conflict since the structure usually does not have well-defined ground rules (Mintzberg, 1979). Areas of authority and responsibility overlap each other leading to conflict (Davis and Lawrence, 1977). Conflicts often arise between project and functional managers over specific specialist assignments. The question is not only "who," but "when" (Greiner and Schein, 1981). Another typical conflict occurs when the project manager wants to sacrifice customary functional standards in the interest of cost or schedule (Sayles, 1976). Kingdon (1973) claims that project managers typically make decisions in light of the project's immediate needs (opportunism), while functional managers approach

decisions with their specialties future needs in mind (utopianism). It is important to strike a proper balance. This does not necessarily result in an exact power equilibrium between the project and functional managers. Rather, it means that the power or authority relationship is consistent with organizational objectives (Knight, 1977). This conflict between project and functional managers can be constructive and lead to creative solutions. However, continuous escalation of unresolved problems can be very harmful to the organization (Sheane, 1977).

Two-Boss Dilemma

Another problem which is inherent in the matrix structure and is related to the first problem mentioned is that of the two-boss dilemma. The person in the middle of the matrix, the functional expert, basically is responsible to two separate bosses, the project manager and the respective functional manager. This predicament often creates stress and frustration in the individual (Ivancevich, Szilagyi, and Wallace, 1977). This situation defies the classical management principle of each subordinate being assigned to only one boss (Greiner and Schein, 1981). The ambiguity of this complex role often leads to anxiety (Kolodny, 1981), or can even take the form of anarchy. The latter would evolve when the matrix relationships are not explicit and people view themselves as "bossless." Due to the confusion over who is really in charge, individuals may feel responsible or accountable to no one at all (Davis and Lawrence, 1977). The anxiety level for those in-the-middle may reach stressful levels when guidance from the project and functional supervisors conflict. This is especially significant if the employee is forced to choose sides (Hitt, Middlemist, and Mathis, 1983). Role

conflict can be a serious problem especially when confronted with conflicting expectations from both supervisors and co-workers (Knight, 1977). When lack of clear expectations exists, rather than definite conflicting expectations, the result is role ambiguity (Knight, 1977). Some people may see this situation as a chance to tailor their role as they see fit, but many others view this unclear state of affairs as disastrous (Kolodny, 1981).

Interpersonal Skills Dependency

These two specific relationship problems of adversarial managers and those caught in-the-middle are subsets of the general human relations problems typical throughout a matrix organization. C. E. Kur (1982) states that matrix management requires above-average interpersonal skills due to the ambiguity and dual-focus of the organization. He continues that this type of structure is more complex than more traditional organizational structures and, therefore, requires greater sophistication in managerial and interpersonal skills. The matrix network consists of a complex variety of teams, projects, functional homes, and ad hoc arrangements. To function in this multidisciplined maze, matrix members must be skilled in interpersonal techniques and be aware of orientation differences (Kolodny, 1979; Galbraith, 1971). There is a great deal of interdependence, and the individual needs to know where and how his piece fits. There are a large number of lateral relationships, both formal and informal, that must be nurtured to insure the health of the organization. People accustomed to a traditional, vertical hierarchy organization may not respond well to the increased interpersonal relationships present in the matrix design. These sometimes vague lines of

communication along with ill-defined job roles and obscure authority relationships can lead to confusion and dissatisfaction (Mintzberg, 1979). Ill-defined lines of communication can turn what should be a benefit into a drawback. Conflict is a way of life in the matrix organization and potentially can enhance the balance between cost, schedule, and performance in decision making. However, conflict is harmful when it repeatedly delays decision making, saps the energy available for productive work, inhibits communication and causes undue stress (Knight, 1977). The matrix organizational structure might be ideal for blending complex multiple interdependencies, but it certainly is not a situation in which an individual searching for security and stability would like to be caught (Mintzberg, 1979).

Professionals

Another specific human factor problem that has been identified is the predicament of the professional in a matrix. Sometimes professionals are very dedicated to their work or profession with little sense of loyalty to a project. Project managers with little formal authority may have difficulty generating a productive response aimed at specific project objectives. Discipline may be hard to establish. In addition, many professionals are unaccustomed to working in a team environment. Their training usually has emphasized individualism and isolated work. Therefore, they may be deficient in cultivating the necessary social relationships of the matrix environment (Greiner and Schein, 1981). Another problem lies in the perceived or actual random and unplanned personal development programs for these individuals. Their immediate boss (project manager) may be so task oriented and their direct supervisor for such a short

duration that the boss feels no responsibility for individual development of the professionals or functional experts (Mintzberg, 1979). Even though functional supervisors often assume this responsibility, cooperation and understanding from the project manager are beneficial. It is the project manager who has the day-to-day contact with the people.

Cost of Communication

Another disadvantage of the matrix organization is the high cost of communication (Mintzberg, 1979). Matrix management is very dependent on extensive communication channels. The design philosophy is used because of the critical, complex interdependencies. Therefore, individuals are expected to communicate laterally and diagonally with other workers for task coordination (Kingdon, 1973). Communication through meetings, phone calls, and other forms extracts a high price in terms of time (Mintzberg, 1979). An individual supporting several projects could probably spend a majority of time attending various meetings.

Groupitis

The remaining four problem areas have been observed and studied by Davis and Lawrence (1977, 1978). The first of these they labeled groupitis. This describes the situation where matrix members think they are a part of a continuous group-decision process. All decisions are assumed to require the active involvement of all team members in order to be legitimate. This, of course, can add to the high cost of communication mentioned in the previous paragraph.

Uncontrolled Layering

Uncontrolled layering is the proliferation of matrices within matrices for other than logical design reasons. The organization may become more

complex than necessary. One of the causes for this phenomena is an inappropriate power imbalance. For example, in response to a perceived internal threat or to lack of desired support, a project may decide to create its own in-house functional expertise. This layering could become never ending and very costly.

Navel Gazing

Davis and Lawrence call this next problem navel gazing. The matrix structure is very complex. Due to the numerous and varied inter-dependencies, there is a great deal of activity creating heavy demands on the team members. It is therefore not uncommon for managers to become preoccupied with the internal matters of the project team while disregarding the outside world. The primary objective of successful project completion while meeting the needs of the customer can get lost in the struggle to win daily battles. This appears to be particularly prevalent in matrix organizations due to the complexity of the internal relationships.

Decision Strangulation

The final problem is referred to as decision strangulation by Davis and Lawrence. With so many interested parties involved, the decision process can easily become clogged. Alternatives sometimes are discussed endlessly at various meetings. Often the decisions must be made and agreed upon in both chains of the dual authority structure. Differences can result in an impasse and lead to escalation, further delaying any decision. Many participants see matrix management as democracy in action. However, the action is neither quick nor decisive. It appears that the decision process depends on the authority and power base of the project manager (Davis and Lawrence, 1977).

CHAPTER III

SOLUTIONS

The disadvantages highlighted in the previous chapter are primarily human problems, both individual and interpersonal. Some of these are not unique to matrix organizations. However, the matrix design structure is a very fertile environment for these kind of problems. The first step in appreciating matrix management and its associated problems is to realize that it is more than a new organizational structure; it is a new experience for many. Switching to a matrix requires a change in behavior on the part of the participants (Kolodny, 1981).

Education

Working in a matrix environment requires a special approach. Education is essential for all participants, not just the managers. This is especially vital if an organization is just switching to a matrix structure. An extensive educational effort is necessary to indoctrinate key managers and professionals with the theory and practice of project management in the matrix culture (Cleland, 1981a). All participants need to understand the matrix structure and the demands of this complex work environment. They need to be aware of the different concerns and perspectives of other team members which will directly influence their own job (Knight, 1977). Davis and Lawrence (1977, 1978) cite education as a key ingredient in preventing the problems of "groupitis" and "navel gazing." People must understand specific relationships and how they fit into the decision making

process. Misunderstandings often exist over how the matrix functions. If people become familiar with it and are aware of some of the typical problems and characteristics, the day-to-day relationships and interactions will become routine and hopefully comfortable. Without explicit training and development, any organization incorporating matrix management will find progress very difficult (Kolodny, 1979)

Interpersonal Skills Development

In addition to merely understanding the matrix mechanism, people require above-average interpersonal skills to operate effectively in a matrix. This is due to the intricate interdependent network of the typical matrix (Kur, 1982). Project managers often must rely on their communication and interpersonal skills because of their lack of formal, position authority in the matrix structure. This is perhaps most important in their relationships with functional professionals (Greiner and Schein, 1981). Some of the key skills which need to be cultivated are conflict resolution, confrontation, negotiation, and meeting management (Kolodny, 1981). Interpersonal skills are essential in developing the appropriate behavior pattern to function effectively in the matrix culture. Behavior characterized by cooperative relationships and procedure adherence will minimize nonproductive conflict and help attain company objectives (Sheridan, 1979). In order to reinforce the importance of interpersonal skills, the organization should encourage continued development of these skills and include evaluation of these skills in the reward system (Kur, 1982). Interpersonal skills should be given concrete attention as are technical skills (Kur, 1982). Promotions should be based partially on how well the individual operates and communicates in the matrix (Cleland, 1981b).

The reward system is a very effective method for affecting desired attitudes and behavior (Sheane, 1977). This should be part of the continuing education process. Davis and Lawrence (1977) have outlined a training program for matrix managers. The following is their suggested program (p. 113):

- Knowledge input about matrix organizations and information about why their organization is adopting matrix. This would include top management philsophy.
- Lecture, discussion, and exercises about effective communication and group process.
- Lecture and exercises on concepts and techniques relevant to the kind of business problem solving expected.
- A simulation in which individuals are randomly placed in groups and given a business task. Each member is given a role to play and each experiences directly the problem of making and implementing decisions. Each examines the experience with the help of a trainer and learns from it.
- The actual teams are brought together to work on a number of exercises to create a low-risk setting for self-examination and learning.
- A team-building meeting is conducted, with a professional as a process consultant, to go over the important startup questions.

The final two ideas of the above Davis and Lawrence (1977) plan deal specifically with team building. For effective matrix operation, team education and development are just as important as individual education.

Team Development

The project team in a matrix often suffers from a vague boundary to separate it from external forces. Isolation from external interference does not exist because the matrix project group depends on the interaction of various resource groups and knowledge sources of the functional organization. This operational aspect does not enhance cohesiveness and identity (Knight, 1977). Thus, it is important to strike a balance between team commitment and total organizational appreciation so that the project team can be effective in this open system. The matrix project team is not self-contained and in full control of its own boundaries and resources. Its real effectiveness depends on how well it handles relationships outside team boundaries (Knight, 1977). Building the team is the first step. The project team needs to be healthy internally in order to relate effectively with external factors.

Organization Development

Organization Development (OD) is the title given to a variety of techniques designed to open an organization's work climate (Briscoe, 1980). These behavioral science techniques are used to improve interpersonal skills. OD usage has flourished partly due to managers recognizing the critical nature of the problems of cooperation and coordination within organizations (Sayles, 1976). OD is an approach to managing change by people and is sometimes referred to as planned change (Shrode and Voich, 1974; Hitt, et al, 1983). OD concentrates on strengthening certain organizational factors, such as communication patterns and group relationships, so that the organization can respond to environmental changes

(Hitt, et al, 1983). OD programs have been used effectively by many companies, such as Ebasco Services, Inc. and TRW ("How Ebasco Makes," 1981; Greiner and Schein, 1981).

Team Building

One OD technique that concentrates on the entire work group rather than individuals is team building. The objectives of team building are primarily coordinating group effort to accomplish mutually acceptable goals and to satisfy team members' personal needs (Shrode and Voich, 1974). Team building focuses on solving problems. The process may be led by either a manager in the organization or an outside consultant. The process consists of identifying and diagnosing problems, clarifying problem factors, proposing and discussing alternate solutions and choosing the most promising solution. The benefits of this process go beyond the specific problem solution. Total group participation throughout the process invokes commitment to the solution or change while at the same time cultivating trust and support among team members (Hitt, et al, 1983). During team building, individual attitudes toward the team and its common problems are highlighted rather than suppressed. It can lead to a clearer understanding of other members' roles and goals (Shrode and Voich, 1974). Sometimes the problems transcend individual groups. When conflicts develop among separate groups, team building can still be used by including members of the conflicting groups (Hitt, et al, 1983).

Team Banding

Closely associated to team building is what Davis and Lawrence (1977) call team banding. They tailor the principles of team building specifically to the task of starting up a matrix team. The essence of team

banding is to spend a concentrated period of time up front to specify roles and procedures so that common expectations and an open climate will prevail. The issues that are openly discussed include group objectives, individual expectations, roles, responsibilities, decision making, communication ground rules, and conflict resolution procedures. Davis and Lawrence (1977) also discuss team disbanding, which is an important feature of the dynamic matrix organization. They state that this inevitable part of organizational life is often ignored. Breaking up of harmonious teams is often a source of resistance to change. The reluctant and sometimes sad feelings over the disbanding of a team should be acknowledged. Davis and Lawrence (1977) suggest that an appropriate ceremony might be helpful in closing the disbanding process.

Quality Circles

Another technique that can improve group effectiveness through employee participation is the quality circle. Japan began using this technique in the 1960s to improve productivity and quality. Although quality circles have been applied mostly in manufacturing situations, there are potential areas for application in the professional work environment (Cleland, 1981b). A quality circle is a relatively small group of people who perform similar work and that meet on a regular basis to discuss and analyze problems. The primary differences from team building are that employee participation is voluntary, there is greater involvement of formal supervisors and quality circles have traditionally concentrated on quality (Hitt, et al, 1983). Quality circle application has gone beyond the quality issue. Imbedded in the technique is the philosophy that the worker can make valuable contributions toward work environment decisions.

If the worker is included in the decision making process, quality of work and job satisfaction will improve. Quality circles can lead to a strong sense of belonging, competitiveness, loyalty, rational decision making and innovation (Cleland, 1981a). Team building and quality circles could end up being the same thing depending on the application. The title is not important as long as the basic ideas are carried out in spirit. For example, Texas Instruments uses "people involvement teams," which are very much like quality circles (Cleland, 1981a).

Program Reviews/Offsites

Two final techniques to help develop the project team are internal program reviews and offsites. Besides the normal program reviews given to upper management, informal reviews internal to the team can be very productive. With each team member covering his/her own part of the project, the other team members not only become educated, but also develop an appreciation for the various project perspectives. This approach may even surface some hidden problems. If not overdone to where they become a burden, periodic reviews beyond those which take place in normal staff meetings can be very rewarding for the group and for the individual. They can add to workers' self-worth and sense of belonging. Occasional off-sites or even breakfast meetings can also be very effective (Peters, 1979). They provide opportunities to concentrate on particular issues in a different setting. Sometimes talking about business matters away from the normal, hectic work environment can add to the cohesiveness of the work team.

Project/Functional Interface

It is extremely important to control the project and functional manager interface. This emphasis must originate from top management

(Sheridan, 1979). Employees are often caught in the middle of this struggle and are sometimes treated solely as resources rather than human beings (Briscoe, 1980). Explicit relationships between functional and project managers should be clearly defined so people will know to whom they are responsible (Davis and Lawrence, 1978). Competition between functional and project managers should be encouraged, but not to the detriment of the organization. There must still be a sense of cooperativeness so that problems can be resolved without constant escalation. Top management should refuse to accept escalated problems except in rare cases. When productive competition turns into ruthless power struggles, the players should be punished (Davis and Lawrence, 1978).

One area in which cooperation between functional and project managers is very important is the management of human resources. Career development and manpower planning should be closely integrated (Briscoe, 1980). Project managers should forecast and communicate their specific manpower requirements as early as possible (Archibald, 1976). A harmonious working relationship between project and functional groups can help balance project requirements with functional specialty requirements and individual career progression goals. This can lead to a better selection of an individual to fit the specific task at hand.

The part that ties the project/functional relationship back into the employee is the appraisal and reward system. The project manager should have a role in appraising the performance of functional people supporting his project. This is a powerful tool. It is necessary so that people become accountable and are given relevant feedback (Briscoe, 1980; Greiner and Schein, 1981). A dual-performance evaluation system also benefits the employees in the middle since they sometimes become caught between conflicting demands (How Ebasco Makes," 1981).

Recognition of Professionals

A few comments concerning the treatment of professionals is appropriate. Support of some projects may not be the most stimulating type of work for professionals. Any situation involving a professional doing rather routine but necessary project support work should not be allowed to exist for an extended period of time. Professional advancement and recognition needs to have strong support. Seminars, conferences, and sabbaticals can reap long-term benefits. A very important consideration is the selection of key functional managers of professional disciplines. Admittedly, they must be attuned to company objectives. However, it is important that these people be highly respected within their specialty for their technical competence (Greiner and Schein, 1981). Professional credibility adds to their effectiveness.

Responsibility Clarification

Responsibility ambiguity is a common problem in the matrix structure. Therefore, continuous responsibility clarification is absolutely necessary. Job descriptions and organizational charts are inadequate to explain the intricate responsibility relationships. Individual responsibilities need to be spelled out (Greiner and Schein, 1981). One method to clarify responsibilities is linear responsibility charting. The purpose of the linear responsibility chart (LRC) is to visually display all personnel, significant activities, responsibilities, and relationships within the organization (Karger and Murdick, 1969). The LRC is useful in defining the functional/project relationships as well as the staff interfaces (Cleland and King, 1975). Part of the value of the LRC is the actual chart development. If team members actively participate in developing the LRC, communications and understanding improve (Archibald, 1976).

However, as Cleland and King (1975) point out, "The LRC does reveal the functional breakout of the work to be done and the interrelationships between the functions and job positions; however, it does not show how people act and interact."

Similar to the LRC is the Responsibility Interface Matrix (RIM) (Kocaoglu and Cleland, 1983). The RIM defines work packages from hierarchial levels of an organization. The actual responsibility matrix is then built around these work packages. As with the LRC, Kocaglu and Cleland (1983) state the development process is probably more important than the subsequent product. They claim that a truly participative development process is so educational in itself that the final chart becomes secondary. The RIM helps eliminate oversights. It helps clarify responsibility, authority and accountability (Kocaoglu and Cleland, 1983).

Effective Communication

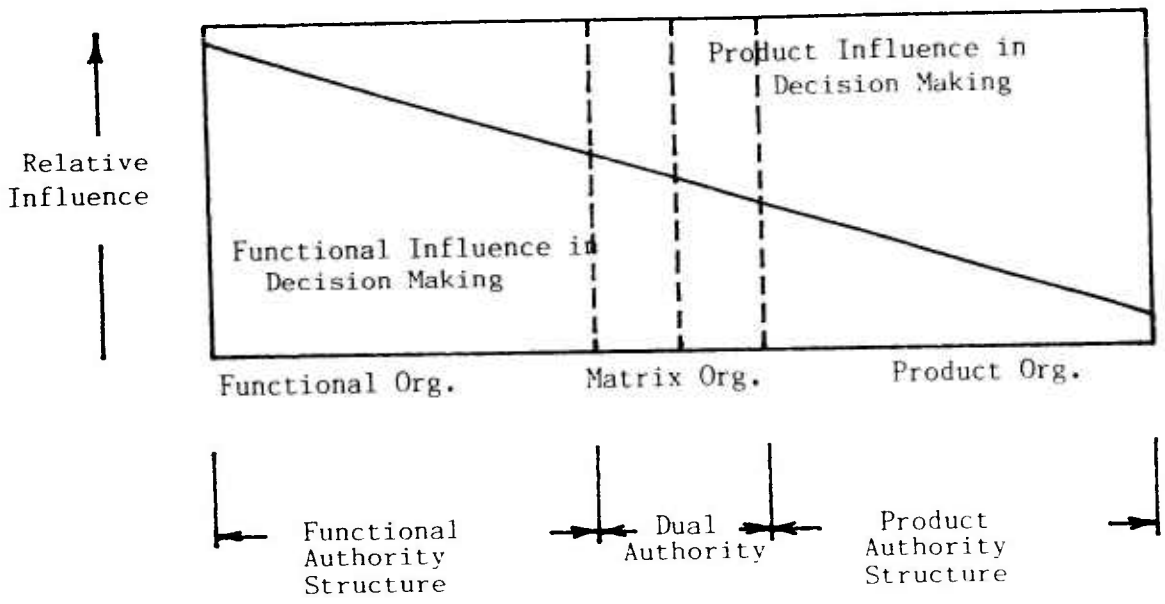
All organizations depend on effective communications. This is particularly important in the matrix environment. Continuous planning and communicating are important. The exchange of timely, task critical information is essential. Once information requirements are defined, every effort should be made to remove communication barriers. If the project team members are to participate fully, they must be kept advised of project developments. One method for doing this is to reverse the flow of status reports. Managers should report on the status of their units or projects to their employees as well as to upper management (Boyle, 1983). Workers will be more responsive and productive if they are kept up to speed. They need to know what's been done, what lies ahead, and what their specific future tasks will be (Boyle, 1983). Important

for project managers is to maintain vigilant day-to-day liaisons with the functional contributors. This constant communication will help assure completion of their project commitments and leave nothing to chance (Archibald, 1976).

Structure

This entire chapter has dealt with ways to maneuver within a matrix to either alleviate or eliminate some of the more typical problems associated with that structural design. What about changing the design? Of course, of primary concern is whether or not a matrix design should be adopted. As Rowen, Howell, and Gugliotti (1980) state in their article, "No organization structure - matrix management or otherwise - can overcome a basic mismatch between culture and business strategy or purpose." There appear to be few really new ideas to handle today's complex, dynamic environment. Most suggestions are variations of a theme, that theme being a matrix blending functional and project characteristics. But these variations are legitimate alternatives to what might be considered a pure matrix design.

A matrix can be skewed toward either the functional or project ends of a continuum representing relative influence of the functional and project forces on decision making (Fig 4) (Galbraith, 1971; Sheridan, 1979). There can also be a mixture within the same company. There might be strictly functional or project divisions in the organization along with various levels of matrix groups (Sheridan, 1979). Davis and Lawrence (1977) write about the evolution of the matrix and that some organizations eventually discard the complex structural form but maintain the real substance, that being matrix behavior. Matrix mechanisms can be used as



Range of Alternatives (Galbraith, 1971)

Figure 4

temporary aids in a more traditional organization. Some companies use task forces to tackle specific projects that necessarily cut across organizational boundaries (Cleland, 1981b). This is a very flexible tool that avoids total structural modification. The organization can also afford to be very selective when choosing the task force members.

Suitable organizational structures are important but are not paneceas. Structural solutions to organizational problems are often pursued because they seem so easy compared to some more vague alternatives (Peters, 1979). Thomas Peters (1979) made the following observations concerning structure:

- Structure is crucial, but unchanging structure is a snare and a delusion.
- The way to use structure successfully is to achieve temporary, dynamic imbalance. No structural solutions - least of all overdetermined structures like matrix - can ever resolve the healthy, inherent tension between centralization and decentralization. That resolution must be actively managed over time.
- Structure is only one of several levers available to the senior executive who seeks to rechannel (and thereby enhance) the energies of a ponderous organization. Others are detailed, persistent intervention in the daily routine and the calculated use of signals that will be credible in the light of the organization's history and culture.

So, it is important that the structural form be compatible with the organization's market environment and objectives. However, the inner processes and relationships must be emphasized and cultivated. This is where the real payoff lies.

CHAPTER IV

SUMMARY/RECOMMENDATIONS

Summary

Some of the problems identified in Chapter II, as well as some of the solutions from the previous chapter, overlap. There is not necessarily a one-for-one match between problems and specific solutions. Table 1 on the following page summarizes potential applications of the identified solutions. Obviously, in some cases certain solutions, such as team development, will help alleviate more than one of the identified problem areas.

Problems common to the matrix organizational structure revolve around the key matrix components and their corresponding relationships. These key components are the managers (project and functional), the functional experts, and the project teams. The relationships usually determine the existence and subsequent severity of specific problems. A common denominator among most of the identified problems is the existence of differing and often conflicting expectations. This can be aggravated by the lack of or failure to use the interpersonal skills needed to function effectively in the complex matrix environment.

Recommendations

There is nothing wrong with the matrix organizational design when properly applied. However, it is different from traditional organizational designs and demands a different thought process. All too often people

TABLE 1

Summary of Problems and Solutions

PROBLEM	SOLUTION
1. Power Struggles	a. Project/Functional Interface b. Responsibility Clarification c. Structure
2. Two-Boss Dilemma	a. Team Development b. Project/Functional Interface c. Effective Communication
3. Interpersonal Skills Dependency	a. Education b. Interpersonal Skills Development c. Team Development
4. Professionals	a. Recognition of Professionals b. Effective Communication
5. Cost of Communication	a. Responsibility Clarification b. Effective Communication
6. Groupitis	a. Education b. Team Development c. Responsibility Clarification
7. Uncontrolled Layering	a. Project/Functional Interface b. Structure
8. Navel Gazing	a. Education b. Team Development c. Responsibility Clarification
9. Decision Strangulation	a. Project/Functional Interface b. Responsibility Clarification

are thrust into a matrix environment with little or no preparation. Therefore, generally speaking, the most important step to take in problem prevention is education. Organizations using a matrix structure should develop a structured education program. Workers need to understand the basic philosophy of matrix management in addition to the specific operating procedures of their organization. Education should include clarification of responsibilities and interfaces. This education process should consist of a combination of formal centralized training and mandatory sessions with immediate supervisors. Every employee must know what to expect from others and what is expected from him or herself in order to be productive.

In addition to education, a great deal of emphasis should be placed on interpersonal skills development both on an individual basis and from a team perspective. Either an in-house capability should be developed to conduct an ongoing program, or experts should be brought in to facilitate this development. An organic capability consisting of true experts would provide flexibility and help insure a continuing development program. The real measure of any organization is how well people relate with their co-workers in pursuit of common objectives. Organizational structure can be of secondary importance when a cooperative team attitude permeates an organization.

REFERENCES

Albanese, R. Managing: Toward Accountability for Performance. Homewood, Illinois: Richard D. Irwin, Inc., 1978

Archibald, R. D. Managing High-Technology Programs and Projects. New York: John Wiley & Sons, 1976.

Boyle, R. J. Designing the Energetic Organization. Management Review, August 1983, pp. 20-25.

Brisco, D. R. Organizational Design: Dealing With the Human Constraint. California Management Review, Fall 1980, pp. 71-80.

Cleland, D. I. The Cultural Ambience of the Matrix Organization. Management Review, November 1981, pp. 24-28; 37-39.

Cleland, D. I. Matrix Management (Part II): A Kaleidoscope of Organizational Systems. Management Review, December 1981, pp. 48-56.

Cleland, D. I. & King, W. R. Systems Analysis and Project Management. New York: McGraw-Hill, 1975.

Davis, S. M. & Lawrence, P. R. Matrix. Reading, Massachusetts: Addison-Wesley, 1977.

Davis, S. M. & Lawrence, P. R. Problems of Matrix Organizations. Harvard Business Review, May-June 1978, pp. 39-50.

DeMaagd, G. R. Management Information Systems. Management Accounting, September 1983, pp. 10; 71.

How Ebasco Makes the Matrix Method Work. Business Week, June 15, 1981, pp. 126; 131.

Flaks, M & Archibald, R. D. The Electronic Engineers Guide to Project Management. Electronic Engineer, April-August, 1968.

Galbraith, J. R. Matrix Organization Designs. Business Horizons, February 1971, pp. 29-40.

Greiner, L. E. & Schein, V. E. The Paradox of Managing a Project-Oriented Matrix: Establishing Coherence Within Chaos. Sloan Management Review, Winter 1981, pp. 53-58.

CONTINUED

Gunz, H. P. & Pearson, A. W. Matrix Organization in Research and Development. In K. Knight (ed.), Matrix Management. New York: Petroceilli Books, 1977.

Hitt, M. A., Middlemist, R. D., & Mathis, R. L. Management, Concepts and Effective Practice. St. Paul: West Publishing Co., 1983.

Ivancevich, J. M., Szilagyi, A. D. Jr., & Wallace, M. J. Jr. Organizational Behavior and Performance. Santa Monica: Goodyear Publishing Co., 1977.

Karger, D. W. & Murdick, R. G. Managing Engineering and Research. New York: Industrial Press, 1969.

Kingdon, D. R. Matrix Organization. London: Tavistock Publications, 1973.

Knight, K. Matrix Management. New York: Petrocelli Books, 1977.

Kocaoglu, D. F. & Cleland, D. I. The RIM Process...a Participative Approach to the Development of Organizational Roles and Interactions. Management Review, October 1983, pp. 57-64.

Kolodny, H. F. Evolution to a Matrix Organization. Academy of Management Review, October 1979, pp. 543-553.

Kolodny, H. F. Managing in a Matrix. Business Horizons, March/April 1981, pp. 17-24.

Kur, C. E. Making Matrix Management Work. Supervisory Management, March 1982, pp. 37-43.

Mee, J. F. Matrix Organization. Business Horizons, Summer 1964, pp. 70-72.

Mintzberg, H. The Structuring of Organizations. Englewood Cliffs, New Jersey: Prentice-Hall, 1979.

Peters, T. J. Beyond the Matrix Organization. Business Horizons, October 1979, pp. 15-27.

Rowen, T. D., Howell, C. D., & Gugliotti, J. A. The Pros and Cons of Matrix Management. Administrative Management, December 1980, pp. 22-24; 50; 59.

Sayles, L. R. Matrix Management: The Structure with a Future. Organizational Dynamics, Autumn 1976, pp. 2-17.

CONTINUED

Sheane, D. The Company- Wide Matrix. In K. Knight (Ed.), Matrix Management. New York: Petrocelli Books, 1977.

Sheridan, J. H. Matrix Maze, Are Two Bosses Better Than One? Industry Week, June 11, 1979, pp. 76-79; 81.

Shrode, W. A. & Voich, D. Jr. Organization and Management: Basic Systems Concepts. Homewood, Illinois: Richard D. Irwin, Inc., 1974.